CLAIMS:

1. A polyimide sulfone resin with a glass transition temperature of from 200-350°C, residual volatile species concentration of less than 500 ppm and a total reactive end group concentration of less than about 120 milliequivalents/kilogram resin.

2. The polyimide sulfone resin of claim 1 which is a polyetherimide sulfone.

3. The polyimide sulfone resin of claim 2 wherein at least 50 mole % of the polyetherimide sulfone repeating units comprise at least one aryl ether linkage, at least one aryl sulfone linkage and at least two aryl imide linkages.

4. The polyimide sulfone resin of claim 1 comprising structural units derived from an aromatic dianhydride selected from the group consisting of 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl sulfone dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl sulfone dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl sulfone dianhydride; 2,2-bis(4-(3,4-dicarboxyphenoxy)phenyl)propane dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl ether dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)benzophenone dianhydride; 2,2-bis([4-(2,3-dicarboxyphenoxy)phenyl]propane dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl ether dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)benzophenone dianhydride; 2-[4-(3,4-dicarboxyphenoxy)phenyl]-2-[4-(2,3-dicarboxyphenoxy)phenyl]propane dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl ether dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)benzophenone dianhydride; 1,4,5,8-naphthalenetetracarboxylic acid dianhydride; 3,4,3',4'-benzophenonetetracarboxylic acid dianhydride; 2,3,3',4'-benzophenonetetracarboxylic acid dianhydride; 3,3',4,4'-

oxydiphthalic anhydride; 2,3,3',4'-oxydiphthalic anhydride; 3,3',4,4'-biphenyltetracarboxylic acid dianhydride; 2,3,3',4'-biphenyltetracarboxylic acid dianhydride; 2,3,2',3'-biphenyltetracarboxylic acid dianhydride; pyromellitic dianhydride; 3,4,3',4'-diphenylsulfonetetracarboxylic acid dianhydride; 2,3,3',4'-diphenylsulfonetetracarboxylic acid dianhydride; 1,4-bis(3,4-dicarboxyphenoxy)benzene dianhydride; 2,2-bis(3,4-dicarboxyphenyl)hexafluoropropane dianhydride; and mixtures comprising at least two dianhydrides.

5. The polyimide sulfone resin of claim 4 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride.

6. The polyimide sulfone resin of claim 4 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride and pyromellitic dianhydride.

7. The polyimide sulfone resin of claim 4 wherein the aromatic dianhydride comprises at least one of 3,3',4,4'-oxydiphthalic anhydride or 2,3,3',4'-oxydiphthalic anhydride.

8. The polyimide sulfone resin of claim 1 comprising structural units derived from an aromatic diamine selected from the group consisting of meta-phenylenediamine; para-phenylenediamine; bis(4-aminophenyl)-2,2-propane; 4,4'-diaminodiphenyl, 3,4'-diaminodiphenyl, 4,4'-diaminodiphenyl ether; 3,4'-diaminodiphenyl ether, 3,3'-diaminodiphenyl ether, 4,4'-diaminodiphenyl sulfone, 3,4'-diaminodiphenyl sulfone, 3,3'-diaminodiphenyl sulfone, 4,4'-diaminodiphenyl sulfide; 3,4'-diaminodiphenyl sulfide; 4,4'-diaminodiphenyl ketone, 3,4'-diaminodiphenyl ketone, 4,4'-diaminodiphenylmethane; 4,4'-bis(4-aminophenoxy)biphenyl; 4,4'-bis(3-aminophenoxy)biphenyl, 1,5-diaminonaphthalene; 3,3-dimethylbenzidine; 3,3-dimethoxybenzidine; benzidine; bis(aminophenoxy)fluorene, 1,3-bis(3-aminophenoxy)benzene, 1,3-bis(4-aminophenoxy)benzene, 1,4-bis(4-aminophenoxy)benzene, bis(4-(4-aminophenoxy)phenyl) sulfone, bis(4-(3-aminophenoxy)phenyl) sulfone, 3,3'-

diaminobenzophenone, 4,4'-diaminobenzophenone, 2,2'-bis(4-(4-aminophenoxy)phenyl)propane, 2,2-bis[4-(4-aminophenoxy)phenyl]hexafluoropropane, 4,4'-bis(aminophenyl)hexafluoropropane, diaminobenzanilide, and mixtures of two or more diamines.

9. The polyimide sulfone resin of claim 8 wherein the aromatic diamine comprises at least one of diaminodiphenyl sulfone or bis(aminophenoxy phenyl) sulfone.

10. The polyimide sulfone resin of claim 1 wherein the polyimide sulfone further comprises structural units derived from a capping agent selected from the group consisting of aromatic dicarboxylic acid anhydrides and primary monoamines.

11. The polyimide sulfone resin of claim 10 wherein the capping agent is selected from the group consisting of aniline, chloroanilines, perfluoromethyl anilines, naphthyl amines, phthalic anhydride, chlorophthalic anhydride, and mixtures of the foregoing.

12. The polyimide sulfone resin of claim 1 having a weight average molecular weight of from 20,000 to 75,000.

13. The polyimide sulfone resin of claim 1 having a polydispersity index of from 2.0 to 2.7.

14. The polyimide sulfone resin of claim 1 wherein the structural units of the polyimide sulfone are essentially free of benzylic protons.

15. The polyimide sulfone resin of claim 1 having a residual volatile species concentration of less than 300 ppm.

16. The polyimide sulfone resin of claim 1 having a residual volatile species concentration of less than 100 ppm.

17. The polyimide sulfone resin of claim 1 having a reactive end group concentration of less than about 60 milliequivalents/kilogram resin.

18. The polyimide sulfone resin of claim 1 having a reactive end group concentration of less than about 40 milliequivalents/kilogram resin.

19. A polyetherimide sulfone resin comprising structural units derived from (i) an aromatic dianhydride selected from the group consisting of 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride, pyromellitic dianhydride, oxydiphthalic anhydride, and mixtures thereof; (ii) an aromatic diamine comprising at least one of diaminodiphenyl sulfone or bis(aminophenoxy phenyl) sulfone,; and (iii) a capping agent selected from the group consisting of aniline, chloroanilines, perfluoromethyl anilines, naphthyl amines, phthalic anhydride, chlorophthalic anhydride, and mixture of the foregoing;

wherein the resin has a glass transition temperature of from 200-350°C, residual volatile species concentration of less than 500 ppm and a total reactive end group concentration of less than about 120 milliequivalents/kilogram resin.

20. A process to prepare a polyimide sulfone resin comprising the steps of:

reacting an aromatic dianhydride, an aromatic diamine and optionally a capping agent selected from the group consisting of aromatic dicarboxylic acid anhydrides and primary monoamines, in a solvent with a polarity index of greater than or equal to 2.3 and a boiling point of greater than or equal to 150°C, wherein either the dianhydride or the diamine or both further comprise a sulfone linkage, and removing said solvent;

wherein the resultant polyimide sulfone has a glass transition temperature of from 200-350°C, residual volatile species concentration of less than 500 ppm and a total reactive end group concentration of less than about 120 milliequivalents/kilogram resin.

21. The process of claim 20 wherein the polyimide sulfone is a polyetherimide sulfone.

22. The process of claim 21 wherein at least 50 mole % of the polyetherimide sulfone repeating units comprise at least one aryl ether linkage, at least one aryl sulfone linkage and at least two aryl imide linkages.

23. The process of claim 20 wherein the aromatic dianhydride is selected from the group consisting of 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl sulfone dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl sulfone dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl sulfone dianhydride; 2,2-bis(4-(3,4-dicarboxyphenoxy)phenyl)propane dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl ether dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4,4'-bis(3,4-dicarboxyphenoxy)benzophenone dianhydride; 2,2-bis([4-(2,3-dicarboxyphenoxy)phenyl]propane dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl ether dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4,4'-bis(2,3-dicarboxyphenoxy)benzophenone dianhydride; 2-[4-(3,4-dicarboxyphenoxy)phenyl]-2-[4-(2,3-dicarboxyphenoxy)phenyl]propane dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl ether dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)diphenyl sulfide dianhydride; 4-(2,3-dicarboxyphenoxy)-4'-(3,4-dicarboxyphenoxy)benzophenone dianhydride; 1,4,5,8-naphthalenetetracarboxylic acid dianhydride; 3,4,3',4'-benzophenonetetracarboxylic acid dianhydride; 2,3,3',4'-benzophenonetetracarboxylic acid dianhydride; 3,3',4,4'-oxydiphthalic anhydride; 2,3,3',4'-oxydiphthalic anhydride; 3,3',4,4'-biphenyltetracarboxylic acid dianhydride; 2,3,3',4'-biphenyltetracarboxylic acid dianhydride; 2,3,2',3'-biphenyltetracarboxylic acid dianhydride; pyromellitic dianhydride; 3,4,3',4'-diphenylsulfonetetracarboxylic acid dianhydride; 2,3,3',4'-diphenylsulfonetetracarboxylic acid dianhydride; 1,4-bis(3,4-dicarboxyphenoxy)benzene dianhydride; 2,2-bis(3,4-dicarboxyphenyl)hexafluoropropane dianhydride; and mixtures comprising at least two dianhydrides.

24. The process of claim 20 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride.

25. The process of claim 20 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride and pyromellitic dianhydride.

26. The process of claim 20 wherein the aromatic dianhydride comprises at least one of 3,3',4,4'-oxydiphthalic anhydride or 2,3,3',4'-oxydiphthalic anhydride.

27. The process of claim 20 wherein the aromatic diamine is selected from the group consisting of meta-phenylenediamine; para-phenylenediamine; bis(4-aminophenyl)-2,2-propane; 4,4'-diaminodiphenyl, 3,4'-diaminodiphenyl, 4,4'-diaminodiphenyl ether; 3,4'-diaminodiphenyl ether, 3,3'-diaminodiphenyl ether, 4,4'-diaminodiphenyl sulfone, 3,4'-diaminodiphenyl sulfone, 3,3'-diaminodiphenyl sulfone, 4,4'-diaminodiphenyl sulfide; 3,4'-diaminodiphenyl sulfide; 4,4'-diaminodiphenyl ketone, 3,4'-diaminodiphenyl ketone, 4,4'-diaminodiphenylmethane; 4,4'-bis(4-aminophenoxy)biphenyl; 4,4'-bis(3-aminophenoxy)biphenyl, 1,5-diaminonaphthalene; 3,3-dimethylbenzidine; 3,3-dimethoxybenzidine; benzidine; bis(aminophenoxy)fluorene, 1,3-bis(3-aminophenoxy)benzene, 1,3-bis(4-aminophenoxy)benzene, 1,4-bis(4-aminophenoxy)benzene, bis(4-(4-aminophenoxy)phenyl) sulfone, bis(4-(3-aminophenoxy)phenyl) sulfone, 3,3'-diaminobenzophenone, 4,4'-diaminobenzophenone, 2,2'-bis(4-(4-aminophenoxy)phenyl)propane, 2,2-bis[4-(4-aminophenoxy)phenyl]hexafluoropropane, 4,4'-bis(aminophenyl)hexafluoropropane, diaminobenzanilide, and mixtures of two or more diamines.

28. The process of claim 20 wherein the aromatic diamine comprises at least one of diaminodiphenyl sulfone or bis(aminophenoxy phenyl) sulfone.

29. The process of claim 20 wherein the polyimide sulfone further comprises structural units derived from a capping agent selected from the group consisting of aromatic dicarboxylic acid anhydrides and primary monoamines.

30. The process of claim 29 wherein the capping agent is selected from the group consisting of aniline, chloroanilines, perfluoromethyl anilines, naphthyl amines, phthalic anhydride and chlorophthalic anhydride.

31. The process of claim 20 wherein the solvent has an auto ignition temperature of greater than or equal to 70°C.

32. The process of claim 20 wherein the solvent is selected from the group consisting of: halogenated aromatics, chlorobenzene, dichlorobenzene, ortho-dichlorobenzene, bromobenzene, nitrobenzene, diphenyl sulfones, diphenyl ethers, alkoxy aromatics, anisole, phenetole, veratrole, aryl ethers, N-alkyl pyrrolidinone, dimethyl sulfoxide, dimethyl acetamide, dimethyl formamide, benzonitrile, hexamethyl phosphoramide, pyridine, pyrrole, sulfolane, methyl benzoate, and mixtures thereof.

33. The process of claim 20 wherein the polymer concentration in the solvent is from 20 % to 60 % by weight.

34. The process of claim 20 wherein the step of removing the solvent comprises using a process selected from the group consisting of: wiped film evaporation, devolatilizing extrusion, disc ring evaporation and combinations thereof.

35. The process of claim 20 wherein the resultant polymer has weight average molecular weight of from 20,000 to 75,000.

36. The process of claim 20 wherein the resultant polymer has a polydispersity index of from 2.0 to 2.7.

37. The process of claim 20 wherein the structural units of the polyimide sulfone are essentially free of benzylic protons.

38. The process of claim 20 wherein the resultant polymer has a residual volatile species concentration of less than 300 ppm.

39. The process of claim 20 wherein the resultant polymer has a residual volatile species concentration of less than 100 ppm.

40. The process of claim 20 which further comprises: at least one step of analyzing the reactive end group concentration of the polyimide sulfone before removing the solvent, and optionally adding at least one of aromatic dianhydride or aromatic diamine or primary monoamine capping agent or aromatic dicarboxylic acid anhydride capping agent.

41. The process of claim 40 wherein at least one of aromatic dianhydride or aromatic diamine or primary monoamine capping agent or aromatic dicarboxylic acid anhydride capping agent is added and the reactive end group concentration of the polyimide sulfone is reanalyzed.

42. The process of claim 20 wherein the resultant polymer has a reactive end group concentration of less than about 60 milliequivalents/kilogram resin.

43. The process of claim 20 wherein the resultant polymer has a reactive end group concentration of less than about 40 milliequivalents/kilogram resin.

44. The process of claim 20 further comprising the step of passing the resultant polymer in a molten state through a filter which will remove particles of greater than or equal to about 100 microns.

45. A process to prepare a polyetherimide sulfone resin comprising the step of:

reacting an aromatic dianhydride, an aromatic diamine and at least one capping agent selected from the group consisting of aromatic dicarboxylic acid anhydrides and primary monoamines, in a solvent with a polarity index of greater than or equal to 2.3 and a boiling point of greater than or equal to 150°C, wherein either the dianhydride or the diamine or both further comprise a sulfone linkage; and

removing said solvent using a process selected from the group consisting of: wiped film evaporation, devolatilizing extrusion, disc ring evaporation and combinations thereof;

wherein the resultant polyetherimide sulfone resin has a Tg of from 200-350°C, residual volatile species concentration of less than 500 ppm and a total reactive end group concentration of less than about 120 milliequivalents/kilogram resin.

46. The process of claim 45 wherein at least 50 mole % of the polyetherimide sulfone repeating units comprise at least one aryl ether linkage, at least one aryl sulfone linkage and at least two aryl imide linkages.

47. The process of claim 45 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride.

48. The process of claim 45 wherein the aromatic dianhydride comprises 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride and pyromellitic dianhydride.

49. The process of claim 45 wherein the aromatic dianhydride comprises at least one of 3,3',4,4'-oxydiphthalic anhydride or 2,3,3',4'-oxydiphthalic anhydride.

50. The process of claim 45 wherein the aromatic diamine comprises at least one of diaminodiphenyl sulfone or bis(aminophenoxy phenyl) sulfone

51. The process of claim 45 wherein the capping agent is selected from the group consisting of aniline, chloroanilines, perfluoromethyl anilines, naphthyl amines, phthalic anhydride and chlorophthalic anhydride.

52. The process of claim 45 wherein the solvent is selected from the group consisting of: halogenated aromatics, chlorobenzene, dichlorobenzene, ortho-dichlorobenzene, bromobenzene, diphenyl sulfones, diphenyl ethers, alkoxy aromatics, anisole, phenetole, veratrole, aryl ethers, N-alkyl pyrrolidinone, dimethyl sulfoxide, dimethyl acetamide, dimethyl formamide, benzonitrile, sulfolane and mixtures thereof.

53. The process of claim 45 wherein the resultant polymer has a residual volatile species concentration of less than 300 ppm.

54. The process of claim 45 wherein the resultant polymer has reactive end group concentration of less than about 40 milliequivalents/kilogram resin.

55. The process of claim 45 further comprising the step of passing the resultant polyetherimide sulfone through a filter of less than or equal to about 100 microns.

56. The process of claim 45 wherein the structural units of the polyetherimide sulfone are essentially free of benzylic protons.

57. An article made from the polyimide sulfone resin of claim 1.

58. An article made from the polyetherimide sulfone resin of claim 2.

59. An article made from the polyetherimide sulfone resin of claim 19.

60. The article of claim 57 wherein the article is metallized with a reflective metal coating.

61. The article of claim 58 wherein the article is metallized with a reflective metal coating.

62. The article of claim 59 wherein the article is metallized with a reflective metal coating.

63. The article of claim 57 wherein the article is selected from the group consisting of; reflectors, connectors, sheet, film, cookware, helmets, medical devices, pumps, trays, food containers, handles, gears, computer parts, appliances, lighting devices and automotive parts.

64. The article of claim 58 wherein the article is selected from the group consisting of; reflectors, connectors, sheet, film, cookware, helmets, medical devices, pumps, trays, food containers, handles, gears, computer parts, appliances, lighting devices and automotive parts.

65. The article of claim 59 wherein the article is selected from the group consisting of; reflectors, connectors, sheet, film, cookware, helmets, medical devices, pumps, trays, food containers, handles, gears, computer parts, appliances, lighting devices and automotive parts.